What is claimed is:

1. A ferroelectric field effect transistor (FET) exhibiting hysteresis, comprising:
a semiconductor substrate of a first conductivity type;
a source, said source comprising a region of said semiconductor substrate doped to have a conductivity opposite that of said semiconductor substrate;
a drain, spaced from said source, said drain comprising a portion of said semiconductor substrate doped to have a conductivity opposite of said substrate,
a channel being formed in the space between said source and said drain;
a ferroelectric layer overlaying the channel;
a conductive electrode layer overlaying the ferroelectric layer;
wherein charge is injected into and removed from the ferroelectric layer, the quantity of charge so stored being selected so as to provide the ferroelectric FET with a first threshold voltage when charge is stored and a second threshold voltage when charge is removed.

2. The FET of claim 1 wherein charge is injected into the ferroelectric FET to produce a first threshold voltage when a first polarization state is determined before power is removed.

3. The FET of claim 1 wherein charge is removed from the ferroelectric FET to produce a second threshold voltage when a second polarization state is determined before power is removed.

4. The FET of claim 1 further comprising a dielectric layer formed between said ferroelectric layer and conductive electrode layer.

5. The FET of claim 1 further comprising a dielectric layer formed between said channel and said ferroelectric layer.

6. The FET of claim 5 wherein charge is injected into the first dielectric layer.

7. The FET of claim 5 wherein the dielectric layer comprises silicon nitride.

8. The FET of claim 5 wherein the dielectric layer comprises silicon dioxide.

9. The FET of claim 5 wherein the dielectric layer comprises thermally grown silicon dioxide.

10. The FET of claim 5 wherein the dielectric layer comprises two or more dielectric sub-layers.

11. The FET of claim 5 wherein the dielectric layer comprises a silicon nitride layer overlying a silicon dioxide layer.

12. The FET of claim 1 wherein the conductive electrode layer comprises a polysilicon-containing material

13. The FET of claim 1 wherein the ferroelectric layer comprises a material having the general formula $A_xMn_yO_z$ where x, y, z vary from 0.1 to 10 and A is a rare earth selected from a group consisting of CE, Pr, Nd, Pm, Sm, Eu, GD, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y or Sc

14. The FET of claim 1 wherein the ferroelectric layer comprises a low-dielectric ferroelectric material.

15. The FET of claim 1 wherein the ferroelectric layer is formed utilizing MOCVD

16. The FET of Claim 4 wherein the dielectric layer is formed utilizing either ALD and MOCVD

17. The FET of claim 5 wherein the dielectric layer is formed utilizing either ALD or MOCVD

18. The FET of claim 4 wherein the dielectric layer comprises a material with a dielectric constant of 10 and greater.

19. The FET of claim 5 wherein the dielectric layer comprises a material with a dielectric constant of 10 and greater

20. The FET of claim 1 wherein charge is injected utilizing mechanisms selected from a group consisting of tunneling, Fowler-Nordheim tunneling, hot carrier injection, avalanche breakdown, and impact ionization.

21. The FET of claim 1 wherein the silicon substrate comprises a CMOS compatible substrate.

22. The FET of claim 1 wherein the silicon substrate comprises a silicon-on-insulator substrate.

23. A method for extending the data retention of a ferroelectric field effect transistor (FET) exhibiting hysteresis, having source, drain, gate and substrate terminals, the method comprising:

determining the state of polarization of the ferroelectric FET before the FET is powered down;

injecting charge into the FET to produce a first threshold voltage if a first polarization state is determined;

removing charge from the FET to produce a second threshold voltage if second polarization state is determined;

determining the state of charge injection when the FET is powered up;

polarizing the FET to first polarization state if a first threshold voltage is determined; and

polarizing the FET to second polarization state if a second threshold voltage is determined.

24. The method of claim 23 wherein injecting charge comprises utilizing mechanisms selected from a group consisting of tunneling, Fowler-Nordheim tunneling, hot carrier injection, avalanche breakdown, and impact ionization.

25. The method of claim 23 wherein injecting charge comprises injecting charge into the dielectric layer in the drain region.

26. The method of claim 23 further comprising operating the FET so that the injected charge is determined by passing current through the FET with source and drain reversed, and wherein a high current represents a first data state and a lower current represents a second data state.

27. The method of claim 23 further comprising eliminating the threshold offset produced by the injected charge.